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Daycase hernia surgery: A missed training opportunity

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ABSTRACT

Introduction: Traditionally uncomplicated elective hernia operations were performed by surgical trainees; allowing them to develop key competencies and skills transferable to emergency hernia surgery. Daycase surgical units (DCU) are increasingly accommodating operations that traditionally contributed to operating lists in general elective theatres. We aim to assess whether DCU could help improve training in hernia surgery.

Subjects and methods: Operative Room Information System (ORMIS) data was collected retrospectively to identify hernia operations performed at a large NHS hospital between January 2007 and 2012. Data collected included operating surgeon(s), procedure performed and procedure time (PT). Hospital coding records were used to collect data related to patient length of stay (LOS), complications, readmissions and deaths within 30 days of procedure.

Results: 4668 hernia operations were performed; 3063 in DCU. 91.5% ($n = 2803$) were open and 8.5% ($n = 260$) laparoscopic repairs. Trainees assisted in 24.6% ($n = 752$) and led 7.8% ($n = 238$) of cases. Overall, the mean PT for consultant led open hernia operations was 37.44 min (95% CI 36.75–38.12) and 43.07 min (95% CI 40.99–45.16) for trainees ($p < 0.05$). Subgroup analysis of all hernia operations performed showed no significant difference in PT between consultants and trainees when performing open bilateral inguinal, femoral, epigastric, incisional and laparoscopic hernia operations. There were no differences in LOS, readmissions and death rates within 30 days of the operation.

Conclusions: DCU are an underutilised opportunity for trainees to acquire experience of hernia operations. When given the opportunity to lead hernia operations in DCU, trainees have similar PT and complication rates to consultants in many instances. Trainees should be encouraged to assist and lead hernia cases in DCU under adequate supervision to ensure appropriate competency is achieved and high standards are maintained.

1. Introduction

The UK Intercollegiate Surgical Curriculum (ISC) states that general surgical trainees must achieve competency in 'diagnosis and management, including operative management, of primary and recurrent abdominal wall hernias'.[1]

Such competency is essential as hernia operations are common and account for a significant proportion of general surgical emergencies. Emergency hernia operations are procedures that general surgical trainees are expected to perform independently to a high standard. These operations can be complex and require a high level of skill to perform safely.[2] Trainees are therefore encouraged to utilise all opportunities to learn hernia operations on routine elective patients in order to develop the necessary essential skills required. Additionally, hernia operations provide general surgical trainees with both open and laparoscopic surgical experience; helping develop core skills transferable to many aspects of general surgery.

There are growing concerns about surgical training, which many feel are attributable to reduced training opportunities. The European Working Time Directive (EWTD), introduced in the UK in 2003, has restricted the number of hours that general surgical trainees are able to work. Though intended to improve working conditions and to increase patient safety, many feel the EWTD has resulted in reduced training opportunities by restricting time in which to acquire operative experience. Studies have found higher surgical trainees are present at 15.5% fewer operations following introduction of the EWTD.[3] Additionally, financial constraints within the UK National Health Service (NHS) has had a detrimental impact upon general surgical training. Independent training operative lists, where a trainee is able to perform operations under

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adequate supervision, are declining in frequency due to poor cost effectiveness.[4] These lists usually cater for fewer patients due to the expected increased procedure time of trainees, which is viewed by some as an inefficient use of resources. Such financial constraints coupled with restrictions on training time highlight the need to fully utilise current training opportunities.

Elective hernia repairs traditionally performed in general elective theatres are increasingly performed at daycase surgical units (DCU). The UK Department of Health defines daycase surgery as; "the admission of selected patients to hospital for a planned surgical procedure, returning home on the same day."[5] DCU are equipped suitably, usually with independent theatres and associated facilities as well as dedicated and appropriately trained theatre support staff. Patients are usually managed by the same consultants who also manage general theatre cases, meaning that trainees have equal and unrestricted access to both general theatres and DCU. There are strict criteria for admission to DCU, including social, medical and surgical factors,[6] with DCU patients often medically fitter with fewer co-morbidities than general theatre patients. DCU patients are therefore relatively less complicated and hence provide a potential for better training opportunity.

DCU facilities offer improved cost effectiveness in comparison to hospital general theatres, as fewer support staff are required and the costs of an overnight patient stay are often removed. Consequently, increasing numbers of operative procedures are being performed in DCU, with the percentage of elective surgical procedures performed on a daycase basis increasing from 55% to over 70% over the past decade.[7] This trend however, has posed a further problem for general surgical trainees. Limited working hours means that trainees are focused on bigger cases, often performed in general theatre lists. These operating lists traditionally included relatively simple cases, such as hernia operations, that the trainee could then perform under supervision. However, such opportunities are declining with the increase in daycase hernia surgery. A change in approach is essential to maintain high standards of general surgical training, with DCU at the heart of it.

We aim to investigate and highlight any potential training opportunities in DCU elective hernia surgery. If utilised effectively, DCU could provide the perfect opportunity to improve elective hernia surgery training, thereby maintaining standards and ensuring future general surgeons are competent in elective and emergency hernia repair.

2. Subjects and methods

Operative Room Information System (ORMIS), a comprehensive theatre management system that allows theatre staff to record and manage information live, was reviewed. Data was collected retrospectively to include operating surgeon(s), patient and procedure performed at the DCU of a large NHS foundation trust between 1st January 2007 and 1st January 2012.

Data related to hernia operations performed at the hospitals DCU was collected for the selected five-year period. A variety of data was collected detailing the operation performed, operating surgeon and outcome measures that can be influenced by the operative technique and thus used as means of comparing operative outcome for trainee and Associate Specialist (AS) led operations to those operations performed by consultant surgeons. For the majority of trainee led procedures the consultant was not scrubbed in but was supervising. Consultant grade was used as the gold standard, as this grade guarantees experience and is achieved only where rigorous standards are met.

In this study, AS are doctors who have achieved the highest rank within a non-consultant pathway, achieved after years of experience. They are able to operate independently without consultant supervision and have over 15 years of experience operating independently. Trainees are either specialist surgical trainees or other equivalent grade surgical doctors.

All hernia operations were carried out as per European Hernia Society guidelines[8] and performed under local, spinal or general anaesthesia as per surgeon or patient preference, with studies suggesting there are no major differences in patient recovery with local spinal or general anaesthetic hernia repair.[9,10]

The outcome measures compared in this study included; procedure time (PT), the patient length of stay in hospital (LOS), hospital readmissions and mortality within 30 days of the operation. PT can be influenced by the surgeons experience and operative technique.[11] Increased PT decreases the number of cases that can be performed on a standard operating list and can increase patient recovery time and may even lead to increased morbidity and therefore LOS.[12] This limits the feasibility of daycase surgery, which can have financial implications. Operating surgeons technique can also directly influence the LOS as well as readmissions to hospital[13]; poor technique can therefore negatively impact on the overall outcome and in some cases is associated with increased mortality.

ORMIS records provided a unique patient identification code that was cross referenced with the hospitals electronic records in order to identify the LOS, readmissions, reasons for readmission as well as 30 day post-operative mortality and cause of death. The hospitals electronic records began recording data relating to readmissions in April 2010 and therefore readmissions analysis only considered operations performed after this date. All readmission notes were reviewed for procedure, surgeon, estimate of operation time, LOS, complications, readmission and reason for this and death rate within 30 days of the operation.

All data collected was categorised by the type of operation and the theatre where the operation was performed. The normally distributed parametric data is presented using the mean (95% Confidence interval (CI)) and non-parametric data as median (interquartile range). Unpaired *t*-test was used to compare two groups where the data is normally distributed and Mann–Whitney *U* test was used where the data was non-parametric. ANOVA was used to analyse more than one group where the data was normally distributed with the post-hoc Tukey test if ANOVA was shown to be significant. Where non-parametric data was analysed the Kruskall Wallis test was used, with Dunn's post-hoc test if this was significant. Differences were considered to be significant at $p \leq 0.05$.

3. Results

4668 hernia operations were performed at the NHS hospital between 1st January 2007 and 2012. Of these, 3063 hernia operations (65.6%) were performed at the hospitals DCU; 91.5% ($n = 2803$) of these DCU operations were open hernia repairs and 8.5% ($n = 260$) were laparoscopic hernia repairs (Table 1).

Consultants performed 62.4% ($n = 1910$) of all the daycase hernia operations, AS performed 29.9% ($n = 915$) of cases and trainees performed 7.8% ($n = 238$) of cases. Trainees assisted in 24.6% ($n = 752$) of operations and led 31.6% ($n = 238$) of the cases that they assisted in.

Overall, the mean PT for consultant led open hernia operations was 37.44 min (95% CI 36.75–38.12) and 34.67 min (95% CI 33.93–39.4) for AS led cases. The mean PT was 43.07 min (95% CI 40.99 45.16) for trainees (Table 1, Fig. 1). There was statistically significant differences between the mean PT for trainee led operations and consultant led cases, $p < 0.0001$.

Subgroup analysis of these open hernia operations revealed that there was no statistically significant difference in PT between consultants, AS and trainees when performing open bilateral inguinal, femoral (Fig. 2), epigastric (Fig. 3) and incisional (Fig. 4) hernia repairs in DCU. Statistically significant differences were seen in unilateral inguinal (Fig. 5) and umbilical/paraumbilical (Fig. 6) hernia repairs (Table 1).

The mean PT for consultant led laparoscopic hernia operations was 55.44 min (95% CI 53.07–57.82) and 65.2 min (95% CI 49.51–80.89) for trainee led operations with no statistically significant differences between the mean PT for both groups ($p = 0.116$) (Table 1, Fig. 7).

The LOS is a measure of the time a patient spends in hospital from admission to discharge and can be used as a good measure of the post-operative recovery and therefore can be used a marker of operative technique.[10] The median LOS for patients who had daycase hernia repairs at the hospitals DCU was <12 h, with the vast majority of patients discharged the same day of surgery regardless of the grade of the operating surgeon (Fig. 8). 5.0% ($n = 12$) of all the trainee led operations resulted in overnight admission (range 0–2 days) compared to 6.0% ($n = 55$) of AS led cases (range 0–6 days) and 5.2% ($n = 99$) of consultant led operations (range 0–4 days) (Table 2). No statistical significant differences were seen between

Table 1
Daycase open hernia operations.

Hernia operation	Number of cases	Mean age (range)	Number attended by trainees (% of operation type)	Trainees			Associate specialists (AS)		Consultants		*p* Value	Notes
				Number led by trainees (% of cases)	% Of cases attended	Mean PT (95% CI)	Number led by as (% of cases)	Mean PT (95% CI)	Consultant led cases (% of cases)	Mean PT (95% CI)		
Unilateral inguinal	2006 (65.5%)	56 (16–89)	451 (22.5%)	161 (8.0%)	35.7%	48.27 (46.1–50.43)	658 (32.8%)	35.88 (35.15–36.61)	1187 (959.2%)	39.98 (39.25–40.72)	< 0.0001	Differences seen between all three groups
Bilateral inguinal	48 (1.6%)	52 (22–78)	11 (22.9%)	0	–		13 (27.1%)	57.69 (48.56–66.82)	35 (72.9%)	57.97 (52.57–63.37)	0.9560	
Umbilical/Paraumbilical	508 (16.6%)	49 (17–80)	109 (21.5%)	50 (9.8%)	45.9%	34.06 (30.06–38.07)	166 (32.7%)	28.98 (27.22–30.75)	292 (57.4%)	28.48 (27.11–29.84)	0.0040	Significance between consultants and trainees $p = 0.0017$
Femoral	48 (1.6%)	51 (23–76)	15 (31.3%)	2 (4.2%)	13.3%	24.5 (18.15–30.85)	10 (20.8%)		36 (79.2%)	27.56 (24.87–30.25)	0.8173	
Epigastric	91 (3.0)	47 (19–74)	17 (18.7%)	9 (9.9%)	52.9%	19.44 (16.07–22.82)	20 (22.0)	27.5 (20.2–34.8)	62 (68.1%)	25.85 (22.79–28.92)	0.2661	
Incisional	48 (1.6%)	53 (31–72)	14 (29.2%)	5 (10.4%)	35.7%	37.4 (8.98–65.82)	27 (56.3%)	38 (29.59–46.41)	16 (33.3%)	36.26 (28.21–44.31)%)	0.9582	
Other open hernia operations	54 (1.8%)	52 (21–72)	11 (20.4%)	1 (1.9%)	9.1%		21 (38.9%)	41.86 (33.19–50.52)	32 (59.3%)	42.53 (34.73–50.33)	0.9079	
Laparoscopic inguinal hernia operations	260 (18.3%)	54 (16–83)	124 (47.7%)	10 (3.8%)	8.1%	65.2 (49.51–80.89)	0		250 (96.2%)	55.44 (53.07–57.82)	0.1158	
Total	3063 (100%)	52 (16–89)	752 (24.6%)	238 (7.8%)	31.6%	–	915 (29.9%)		1910 (62.4%)		<0.0001	Statistical significance between all three groups

Fig. 1. Comparison of overall mean procedure time for consultants, associate specialists and trainees to perform an open hernia operation in daycase.

consultants and trainee led operations ($p = 0.916$) or consultant and AS led operations ($p = 0.658$).

Readmissions to hospital within 30 days of operative procedure can be influenced by many factors and can occur due to reasons unrelated to the procedure. Readmissions related to operations were formally recorded electronically from April 2010. Of the 1107 hernia operations performed from 1st April 2010, 16 readmissions were recorded. 50% were related to consultant led operations with the remaining 50% related to AS led operations. No readmissions were noted for trainee led operations within 30 days of discharge over this period. The reasons for readmission included post-operative pain and wound infection, with the commonest reason for readmission resulting from post-operative haematoma (Table 3).

Death within 30 days of the procedure can sometimes be influenced by the operation and operative technique. None of the operations resulted in death within 30 days of the procedure; however one death was recorded within 30 days of operation due to reasons unrelated to their operation.

4. Discussion

Hernia operations are a key component of general surgical training. They provide an ideal opportunity for trainees to acquire and improve core surgical techniques and instill confidence in management of a hernia-related emergency. They have traditionally provided the perfect opportunity for trainees to develop and demonstrate anatomical knowledge and operative skills. However, in our sample trainees assisted and took the lead in a minority of daycase hernia operations, despite a large volume and variety of cases.

Fig. 2. Comparison of mean procedure time for consultants, associate specialists and trainees to perform an open femoral hernia operation in daycase.

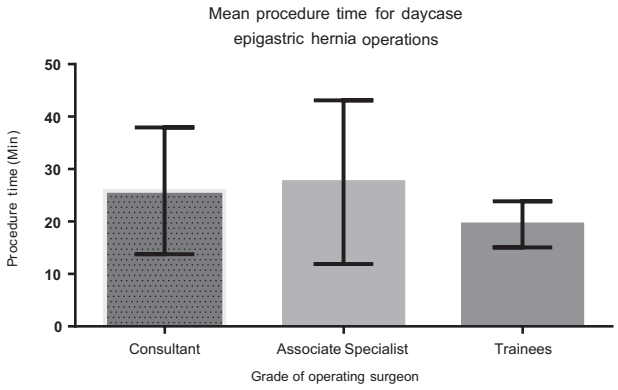

Fig. 3. Comparison of mean procedure time for consultants, associate specialists and trainees to perform an open epigastric hernia operation in daycase.

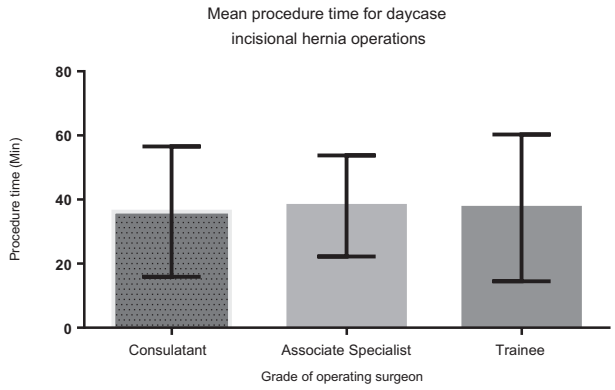

Fig. 4. Comparison of mean procedure time for consultants, associate specialists and trainees to perform an open incisional hernia operation in daycase.

As expected, the vast majority of hernia operations were performed within DCU as opposed to general theatres, confirming the trend towards performing simpler elective procedures in a daycase environment Analysis of trainees that assisted in DCU hernia operations revealed interesting results. Despite the overall increase in the PT when performing open hernia operations in comparison to consultants, trainees were found to have no associated increased patient LOS or readmission rate when compared to consultant surgeons and AS. This supports previous findings looking at post-operative outcomes in trainee led cases.[13]

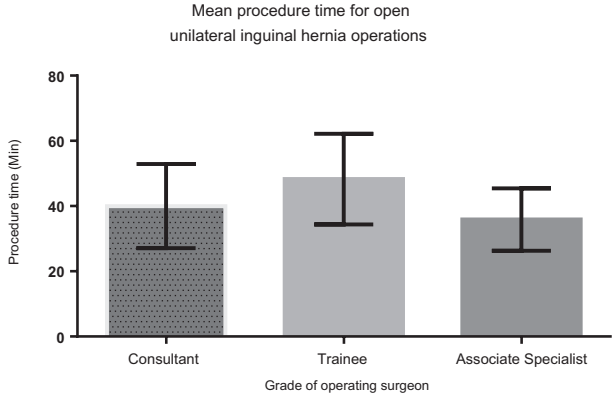

Fig. 5. Comparison of mean procedure time for consultants, associate specialists and trainees to perform an open unilateral inguinal hernia operation in daycase.

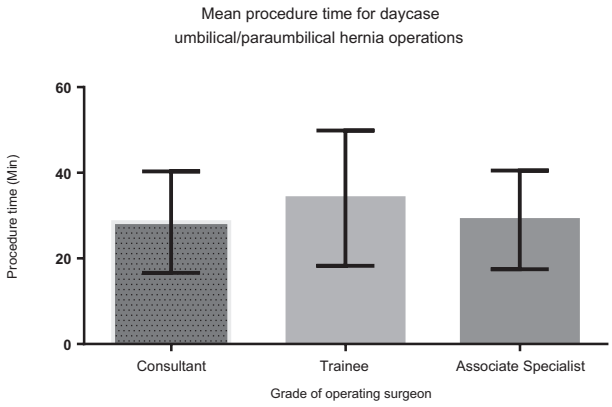

Fig. 6. Comparison of mean procedure time for consultants, associate specialists and trainees to perform an umbilical/paraumbilcal hernia operation in daycase.

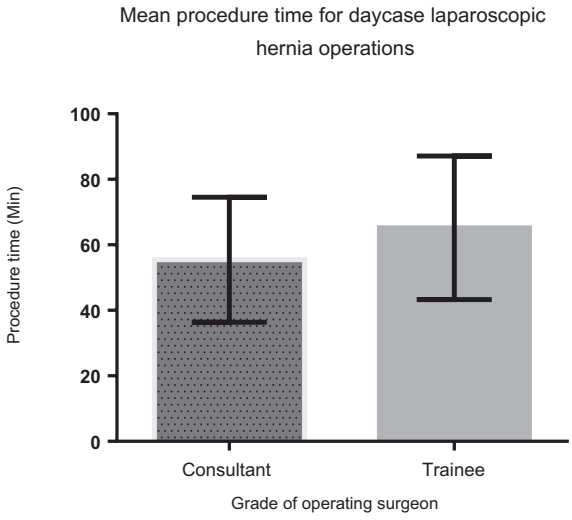

Fig. 7. Comparison of mean procedure time for consultants and trainees to perform laparoscopic hernia operations in daycase.

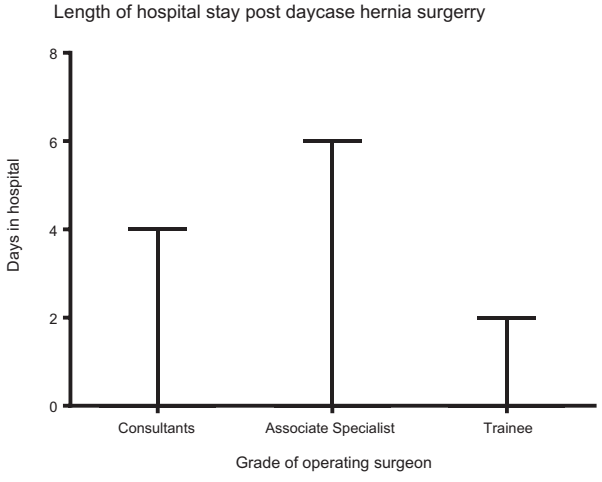

Fig. 8. Comparison of length of hospital stay (LOS) following consultant, associate specialist and trainees led hernia operations in daycase median LOS is less than 24 h for all three groups.

Table 2
Length of stay in hospital following daycase hernia operations.

Hernia operation	Trainees		Associate specialist		Consultant		p Value	Notes
	LOS < 24 h	LOS > 24 h	LOS < 24 h	LOS > 24 h	LOS < 24 h	LOS > 24 h		
Unilateral inguinal	8	1	27	2	46	5	0.6258	
Bilateral inguinal	0	0	0	0	3	2	0.7401	
Umbilical/Paraumbilical	1	0	13	3	12	0	<0.0001	Significance between all three groups $p < 0.05$
Femoral	0	0	0	0	2	0	0.5166	
Epigastric	0	1		3	3	2	0.085	
Incisional	0	0	1	0	2	0	0.6615	
Other open hernia operations	0	1	7	0	0	0	0.0247	
Laparoscopic inguinal hernia operations	0	0	0	0	15	7	0.9298	
Total	9	3	47	8	83	16	0.5578	

Table 3
Daycase hernia operations and readmission from 1st April 2010.

Operations after April 2010	Consultant led	Associate specialist led	Trainee led
Total number of operations	698	366	43
Number of readmissions	8	8	0
% Of total operations performed	1.1%	2.2%	–

Similarly, subgroup analysis in open unilateral inguinal and umbilical/paraumbilical hernia repairs showed trainees to have a longer PT, but no significant increase in LOS and readmission rates compared to consultant surgeons.

However, trainees performing open bilateral inguinal, femoral, epigastric, incisional and laparoscopic hernia repairs in DCU were not only found to have comparable patient LOS and readmission rates to consultant surgeons, but there was also no significant difference found in PT. These findings would suggest that trainees can competently lead these subgroups of elective open and laparoscopic hernia repairs in DCU, as the comparable PT would result in minimal impact on service and therefore cost.

One hypothesis to explain why trainees showed a prolonged PT when performing unilateral inguinal and umbilical/paraumbilical hernia repairs is that these are two of the commonest procedures performed. These cases traditionally are amongst the first procedures junior trainees learn to perform and demonstrate competency. There is also a greater teaching opportunity for junior surgical trainees given the relatively higher caseload, which could result in prolonged PT considering the limitations in technical ability and confidence of junior trainees. In addition to the trainee perspective, one should also consider the direct relationship between caseload and perfecting technical ability for consultants, which may also result in lower PT in these common cases. Other hernia repairs mentioned with comparable PT are relatively less common; in particular femoral and laparoscopic hernia repairs, and are therefore arguably more complicated in some instances, possibly impacting on consultant PT. It is also important to consider that these relatively more complicated operations require higher technical skill and therefore are more commonly performed by experienced surgical trainees with well developed technical ability, resulting in a PT that is comparable to consultants.

DCU were created as a way to provide a more efficient surgical service, with minimal impact on patient experience and indeed operative outcome. To maximise the efficacy, relatively less complicated patients are selected for DCU. Consequently, it would appear that DCU provides an ideal environment for training, which is currently underutilised. This missed opportunity is likely to impact on the ability of trainees to acquire hernia operative competency under adequate supervision. Acquiring such competency in elective cases, not only will trainees will feel far more comfortable in managing emergency hernia repairs, but patient care is likely to improve. Some regions in the UK have implemented changes in local policy to only allow NHS funding for hernia surgery for symptomatic or complicated hernias, this is likely to result in a significant reduction in the number of cases performed in some NHS hospitals. Using all available training opportunities in hernia surgery is therefore of paramount importance for surgical trainees. Such cost cutting measures are being considered widely given the current financial climate and could have a serious impact on training opportunities.

Another obstacle that faces DCU hernia training is a view that DCU training should not take place due to the potential cost implications resulting from increased PT and potential complications. Our results show that this is not true in all hernia operations performed at the DCU and therefore trainees should be encouraged to lead in cases appropriate to their experience and ability. A change in attitude may be all that is required. Trainees should be encouraged to assist and lead in DCU operating lists whenever possible, especially in operations appropriate to their ability under adequate supervision.

Where there is concern regarding the PT, a time specific goal should be discussed and agreed by the trainee and trainer in advance. Such a goal would be then be made known to all involved in the operation at the outset, and would outline a specific amount of time during the operation that the trainee has to lead the operation. The trainer would then resume the lead of the operation once the specified time had elapsed. Such an approach would all but guarantee hands on experience and aims to allow trainees to perform various aspects of an operation over a period of time under adequate supervision. In addition, this would help encourage trainees to attend and assist in all operations and will help in allowing exposure to all aspects of an operation over time. Furthermore, it will encourage trainees and trainers to focus on specific goals tailored to individual needs without significant impact on PT. Having all members of the team onboard will limit objection to trainees leading, which can sometimes limit training opportunity.

DCU offers an ideal opportunity for trainees to assist-in and lead hernia operations on relatively uncomplicated patients, and are currently underutilised. A change in attitude amongst surgical trainers and trainees is essential to maximise the current training opportunities. Surgical training faces many challenges.[14–16] Opinions vary on how to best overcome these challenges, but all agree that trainees need to develop competencies in operating and the current high standards of care need to be maintained.

5. Conclusions

DCU are currently an underutilised opportunity for general surgical trainees to acquire experience of hernia operations. When given the opportunity to lead hernia operations in DCU, trainee involvement does not influence patient outcome adversely and only prolongs PT in certain subtypes of hernia operations. Trainees should therefore be encouraged to assist and lead hernia cases in DCU under adequate supervision to ensure that current high standards are maintained.

Ethical approval

This was a review of the database; no personal data was collected or disclosed. Approval was sought in line with local policy for the data collected from the hospital database. No ethical approval was required for this work.

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Author contribution

All the authors were involved in designing the project, data analysis and the write up of the manuscript.

Conflict of interest

Some of the authors are doctors in training.

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